MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

TSW 3241 – SEMANTIC WEB TECHNOLOGY

(All sections / Groups)

6 March 2020
3:00pm – 5:00pm
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This Question paper consists of **TEN pages**, which includes the front cover, with **FIVE Questions** only.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please print all your answers in the answer booklet provided, and start each question on a new page.

Question 1 [10 marks]

(a) Explain the following terminologies:

(i) Extensible Markup Language (XML)

[2 marks]

(ii) Resource Description Framework Schema (RDF Schema)

[2 marks]

(iii) RDF Triple

[2 marks]

(b) The World Wide Web (WWW) is penetrating various aspects of human daily activities. List and explain TWO examples of websites that can be accessed for services through WWW.

[2 marks]

(c) A schema knowledge can be represented as either a taxonomy or a partonomy. Explain, by giving examples, the schema knowledge in taxonomy and partonomy.

[2 marks]

Continued...

Question 2 [10 marks]

(a) Given the following sentences typed in two paragraphs:

> It was a dark and stormy night. Wolves howl in the distance.
>
> Inside, the flames in the fireplace struggled to resist the draft through the window. Alice struggled to stay warm under a blanket.

Write an XML-document comprising three elements, namely, document, paragraph and sentence.

[3 marks]

(b) A bookstore has the following book records:

Title	*Language*	*Author*	*Year*
Masakan Melaka	Malay	Nyonya Chang	2019
Aladdin	English	Alan Menk	2019

(i) Write an XML-document to include information above.

[4 marks]

(ii) Draw a tree diagram for (i).

[1 mark]

(iii) The two books above are from different categories, namely, *cooking* and *children*. This category information is defined as an attribute of the element *Title*. Write XML statements.

[1 mark]

(c) Is the following document well-form? Explain any NO answer and make correction.
<biol><movie>Enter the void <director></movie>Tom Kan<director></biol>

[1 mark]

Continued...

Question 3 [10 marks]

(a) Given a record from a movie list, as follows:

Title	Director	Genre	Length
Dark Waters	Todd Haynes	History	130

The Uniform Resource Identifier (URI) of the movie is http://www.moviefone/movie#".
Write RDF/XML statements to represent the record.

[2 marks]

(b) Five Turtle statements without using prefixes are given below:

```
<http://wschool.org/resource/Kuching>
<http://example.org/terms/capital>
<http://wschool.org/resource/Sarawak> .

<http://wschool.org/resource/Kuching>
<http://example.org/terms/nickname>
"The Cat City" .

<http://wschool.org/resource/Sarawak>
<http://example.org/terms/nickname>
"Land of the Hornbills" .

<http://wschool.org/resource/Sarawak>
<http://example.org/terms/population>
"2619 758"^^xsd:integer .
```

(i) Convert all statements above into another Turtle version using the following prefixes:

```
@prefix db: <http://wschool.org/resource/>
@prefix dbo: <http://example.org/terms/>
```

[4 marks]

(ii) Draw a graph to represent all statements.

[1 mark]

Continued...

Question 3 (continued...)

(c) Given a sentence as follows:

https://www.amazonbook/Between_Shadows is a type of story book.

(i) Identify the *triple* of this sentence.

[1 mark]

(ii) Convert the sentence into the format of RDF/XML using RDF syntaxes.

[2 marks]

Continued...

Question 4 [10 marks]

(a) OWL Full is *undecidable*. Explain this term *undecidable*.

[1 mark]

(b) Explain TWO limitations of Resource Description Framework Schema (RDFS).

[2 marks]

(c) Another species of OWL is OWL Description Logic (OWL DL). Use OWL DL to model the following sentences.

(i) Oranges are a subclass of fruit.

[1 mark]

(ii) Pineapple, rice, chicken and cabbage are not of the same class.

[2 marks]

(iii) Each pizza has cheese as topping.

[2 marks]

(iv) Weekend can be either Saturday or Sunday.

[2 marks]

Continued...

Question 5 [10 marks]

(a) Translate the following sentences into description logic SROIQ.

(i) The individual *swimming* is an element of the class *sports*.

(ii) The class *animal* consists of all elements from the class *bird* and the class *reptile*.

(iii) All students are hardworking.

(iv) A mother who has a smart child.

[2 marks]

(b) Given the following rules:

croakes(X) ∧ eatFlies(X) → frog(X)
chirps(X) ∧ sing(X) → canary (X)
frog(X) → green(X)
canary(X) → yellow(X)

Alice's new pet "Frig" croakes and eat flies. What is the conclusion? Show your working.

[3 marks]

Continued...

Question 5 (continued...)

(c) Given a database as follows:

```
@prefix mce: <http://www.mce.org/semantic_web_class/> .

mce:Paul      mce:hasMark   28.
mce:Paula     mce:hasMark   24.
mce:Mary      mce:hasMark   25 .
mce:Peter     mce:hasMark   22 .
mce:Wilson    mce:hasMark   23 .
mce:Reuben    mce:hasMark   27 .
mce:Michael   mce:hasMark   30 .
mce:Peterson  mce:hasMark   32 .
mce:Lester    mce:hasMark   34 .
mce:Sally     mce:hasMark   24 .
mce:Charlie   mce:hasMark   30 .
mce:Alan      mce:hasMark   21 .
```

Write an SPARQL query to

(i) return top 3 students by mark.

[2.5 marks]

(ii) ask for a list of students who achieve 24 marks.

[1.5 marks]

(iii) return average mark.

[1 mark]

Continued...

APPENDIX

1. Overview of OWL 1 Language Constructs

1.1 Header

rdfs:comment	owl:versionInfo	owl:DeprecatedClass
rdfs:seeAlso	owl:priorversion	owl:DeprecatedProperty
rdfs:label	owl:backwardCompatibleWith	owl:imports
rdfs:isDefineBy	owl:incompatibleWith	

1.2 Relations Between Individuals

owl:sameAs		owl:differentFrom
owl:AllDifferent	together with	owl:distinctMembers

1.3 Class Constructs and Relationships

owl:Class	owl:Thing	owl:Nothing
rdfs:subClassOf	owl:disjointWith*	owl:equivalentClass
owl:intersectionOf	owl:unionOf*	owl:complementOf*

1.4 Role Constructors, Relationships and Characteristics

owl:ObjectProperty	owl:FunctionalProperty	rdfs:range
rdfs:subPropertyOf	owl:inverseOf	owl:SymmetricProperty
rdfs:domain	owl:DatatypeProperty	owl:InverseFunctionalProperty
owl:TranstiveProperty	owl:equivalentProperty	

1.5 Allowed Datatypes

The standard only requires the support of xsd:string and xsd:integer

xsd:string	xsd:boolean	xsd:decimal
xsd:float	xsd:double	xsd:dateTime
xsd:time	xsd:date	xsd:gYearMonth
xsd:gYear	xsd:gMonthDay	xsd:gDay
xsd:gMonth	xsd:hexBinary	xsd:base64Binary
xsd:anyURI	xsd:token	xsd:normalizedString
xsd:language	xsd:NMTOKEN	xsd:positiveInteger
xsd:NCName	xsd:Name	xsd:nonPositiveInteger
xsd:long	xsd:int	xsd:negativeInteger
xsd:short	xsd:byte	xsd:nonNegativeInteger
xsd:unsignedLong	xsd:unsignedInt	xsd:unsignedShort
xsd:unsignedByte	xsd:integer	

Continued...

2. Overview of Additional OWL 2 Language Constructs

2.1 Declaring Individuals

owl:NamedIndividual		

2.2 Class Relationships

owl:disjointUnionOf	owl:AllDisjointClasses	owl:members

2.3 Role Characteristics and Relationships

owl:AsymmetricProperty	owl:ReflexiveProperty
owl:IrreflextiveProperty	owl:topDataProperty
owl:topObjectProperty	owl:bottomDataProperty
owl:bottomObjectProperty	owl:AllDisjointProperty
owl:propertyDisjointWith	owl:hasKey
owl:propertyChainAxiom	owl:inverseOf

2.4 Role Restrictions

owl:maxQualifiedCardinality	owl: minQualifiedCardinality
owl:qualifiedCardinality	owl:onClass
owl:onDataRange	owl:hasSelf

2.5 Role Assignments

owl:NegativePropertyAssertion	owl: sourceIndividual
owl:assertionProperty	owl:targetIndividual
owl:targetValue	

2.6 Datatype Restrictions

owl:onDataType	owl: withRestrictions
owl:datatypeComplementOf	

2.7 Additional Datatypes

owl:real	owl:rational	rdf:PlainLiteral
rdf:XMLLiteral	xsd:dateTimeStamp	

End of Paper